Fig. 1

Ad Insertion Overview

Multicast Content Generation System with per Stream Ad Insertion (National Ad Generation & Insertion) — 100

Server Data Base — 101

Internet — 103 / 135

pop pop pop — 131

Multicast Content Distribution Network — 104

Regional Network (last mile) — 132

102

130

120

122

134

Regional Advertisement/Content Insertion — 106

125

126

Regional Network — 124

128

Regional Demographic Advertisement/Content Insertion — 108

111

110

112

NSP/RBOC/DSP Regional Network

114

Recipients/Internet users

Multicast Program Content (Program 1)

Multicast Program Content (Program 2)

Multicast Program Content (Program 3)

100

Ad Trigger

Ad Trigger

Ad Trigger

143

143

141

Encoder S1

Encoder S2

· · ·

Encoder Sm

140

140

140

140

142

146

144

Stream Server

148

150

151

National Ad Insertion System

152

154

AI S1

AI S2

· · ·

AI Sm

156

158

160

162

To Content Distribution Network (104)
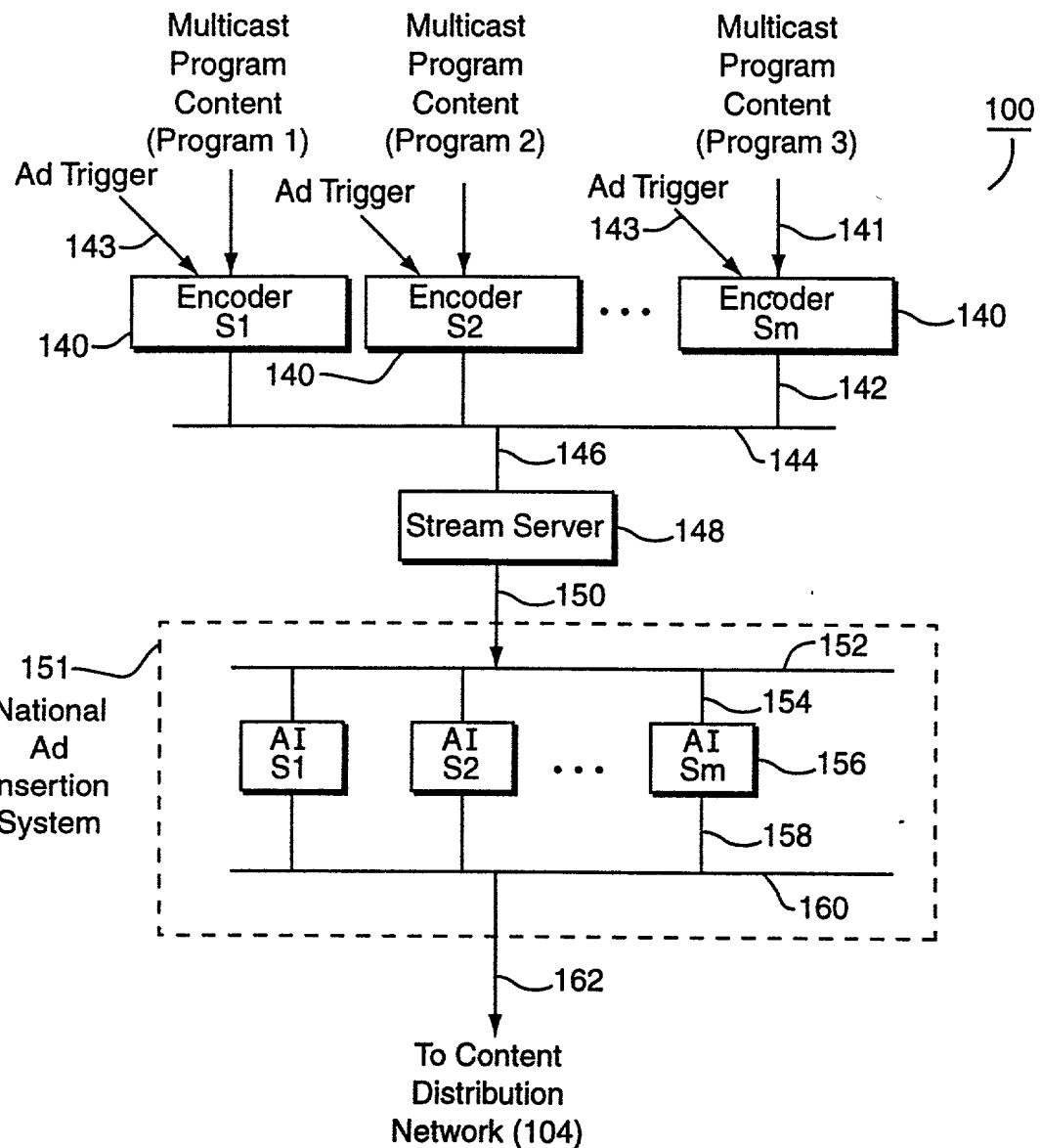
Fig. 2

Example Multicast Content Generation System and per Stream Arrangement National Ad Insertion System

Packet Stream
Input

156

176

AI

CPU	Monitor	Ethernet NIC

170   172   174

184

Memory	Keyboard	Ethernet NIC

178   180   182

186

Packet Stream
Output
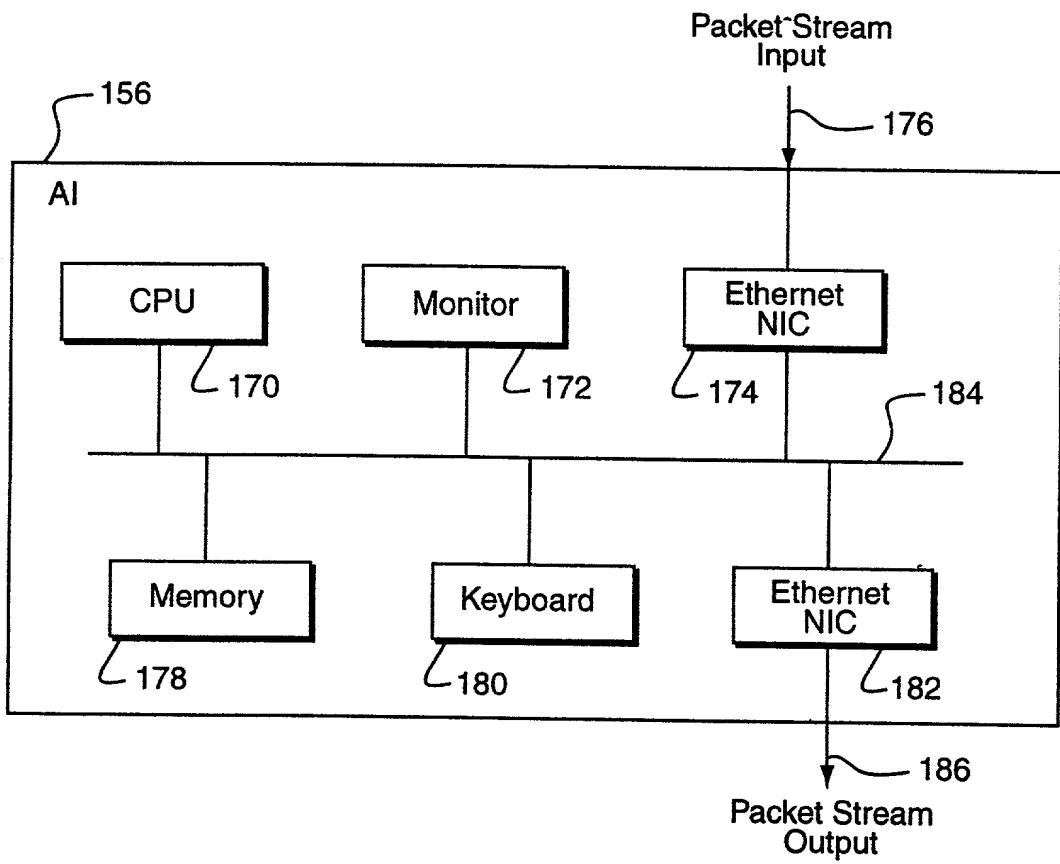
Fig. 3

Example Ad Insertion Hardware/
Packet Replication Hardware
Arrangement

Original Data Packets in a Particular Content Stream

S1 in

| C n | C n+1 | C n+2 | C n+m | C n+m+1 | C n+m+p | C n+m+p+1 |

190

Packets/frames to be Replaced

| A 1 | A p |

Packets/frames to be Inserted

S1 out

| C n | C n+1 | C n+2 | C n+m | A 1 | A p | C n+m+p+1 |

Content Stream after Ad Insertion
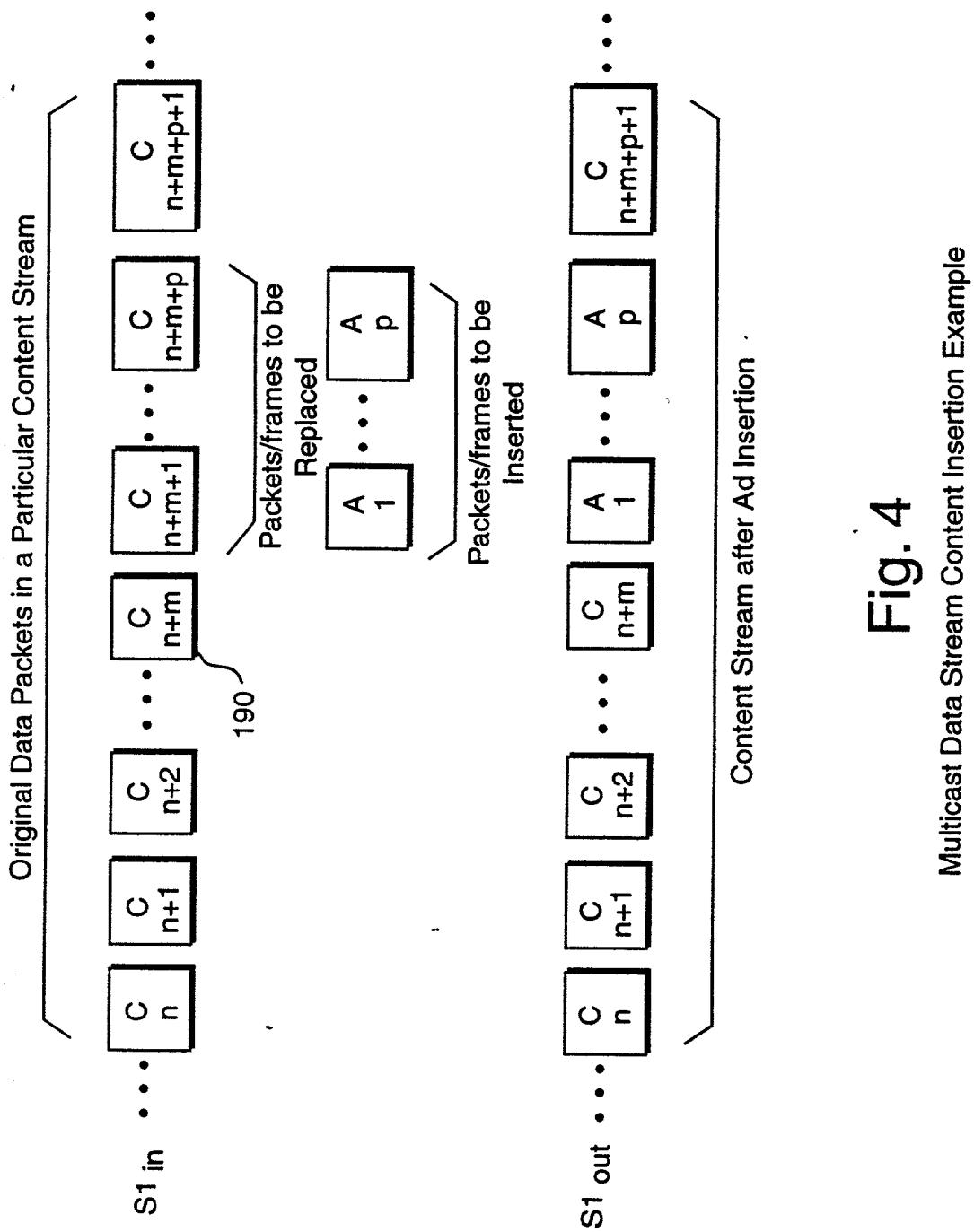
Fig. 4

Multicast Data Stream Content Insertion Example

Content
Source

From Content
Distribution Network

122

Regional
Ad Insertion
System

~202

~206

| AI S1 | | AI S2 | ••• | AI Sm |

~156

~210

~204

To Regional Network
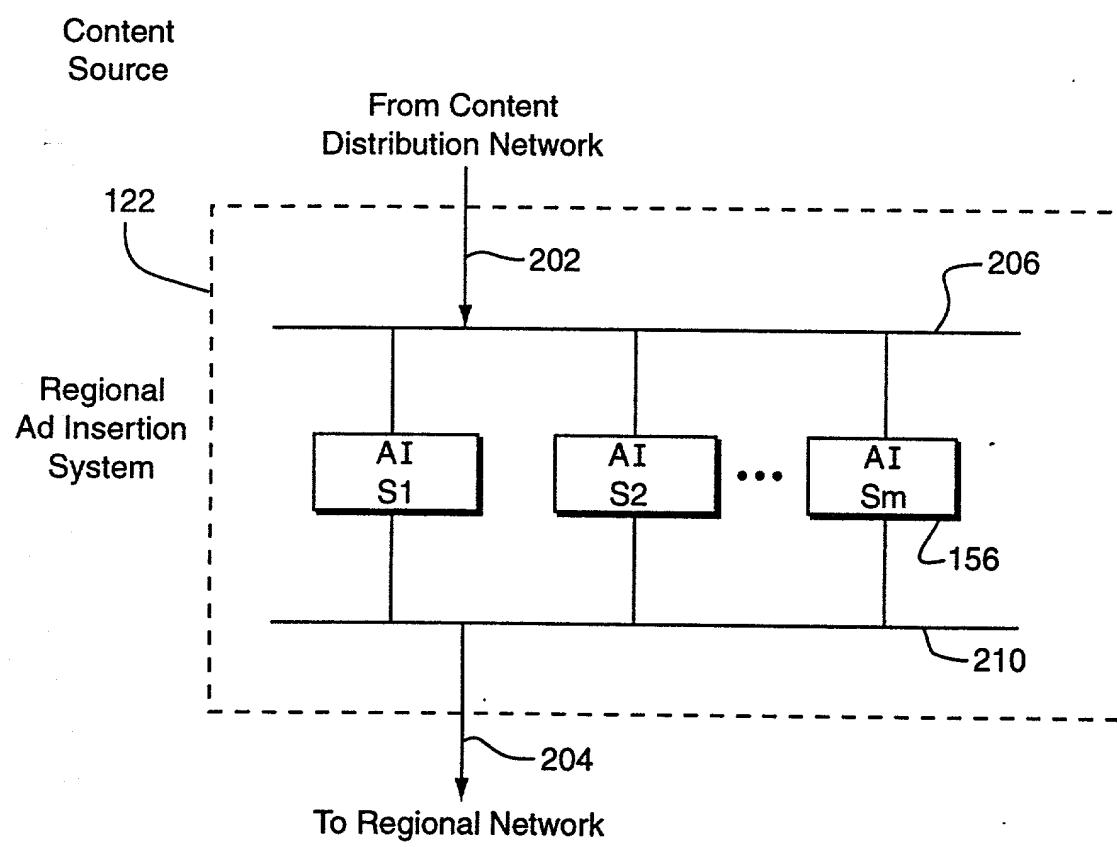
Fig. 5

Example Regional Ad Insertion System Arrangement

Content Source

M Streams Input
From Content
Distribution Network

108

212 — 210

213

Sm Packet Replication

m packet
replicators

S2 Packet Replication

214 — S1 Packet Replication

Replicated
Stream
Creation

224

215

216

n Ad Inserter
per Stream

Ad
Insertion
Device
Array

218

| AI1 S2 | | AI2 S2 | ... | AIn S2 |

| AI1 S1 | | AI2 S1 | ... | AIn S1 |

220

222

m x n Streams Output
To Regional Network
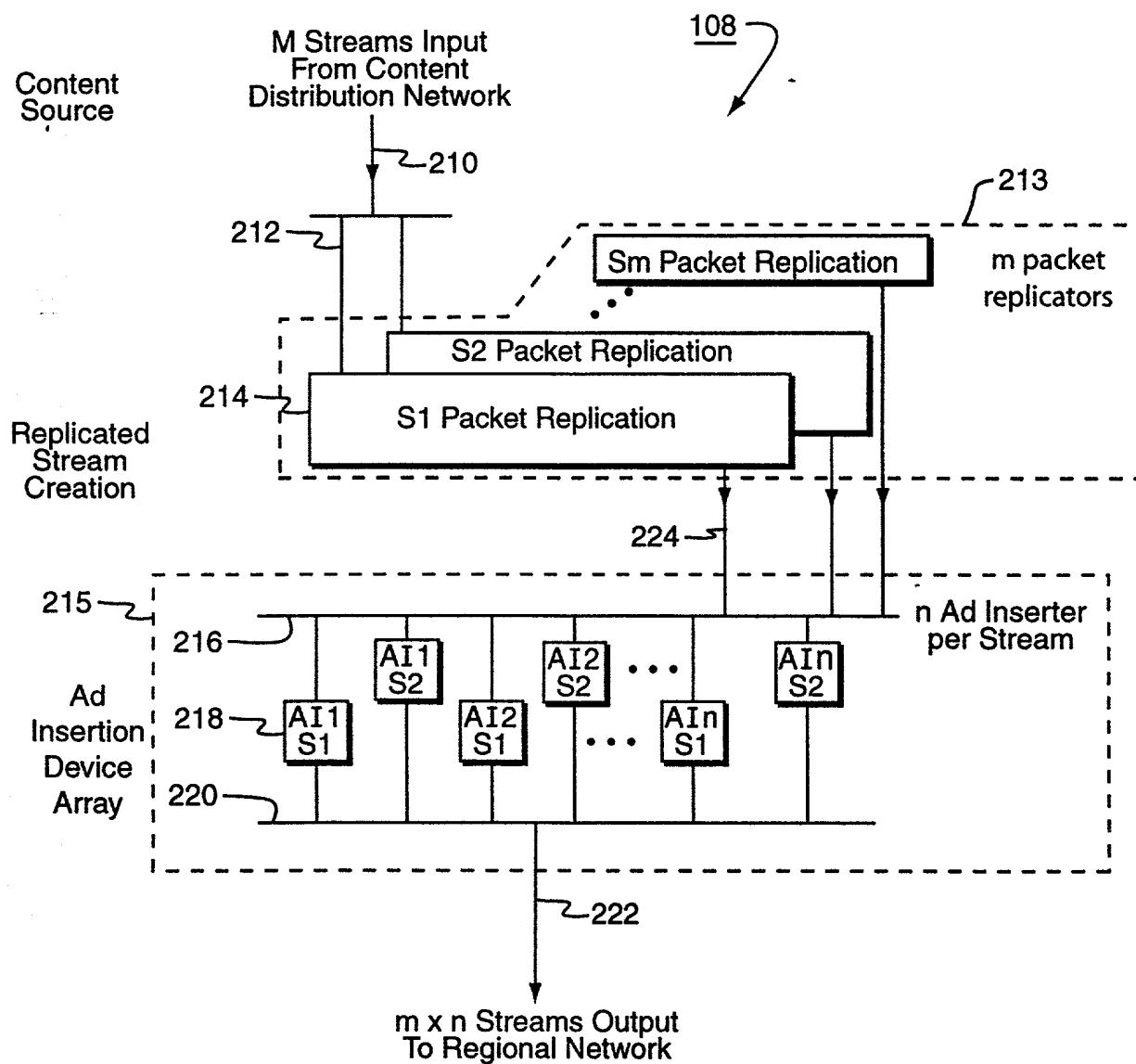
Fig. 6

Example IP Multicast Demographic Ad Insertion/
Generation System Arrangement

IP Header	UDP Header	UDP DATA

Source UDP Packet

copy1

IP Header 1 (modified)	UDP Header 1 (modified)	UDP DATA

Destination UDP Packets

copy2

2	2	DATA

copy3

3	3	DATA
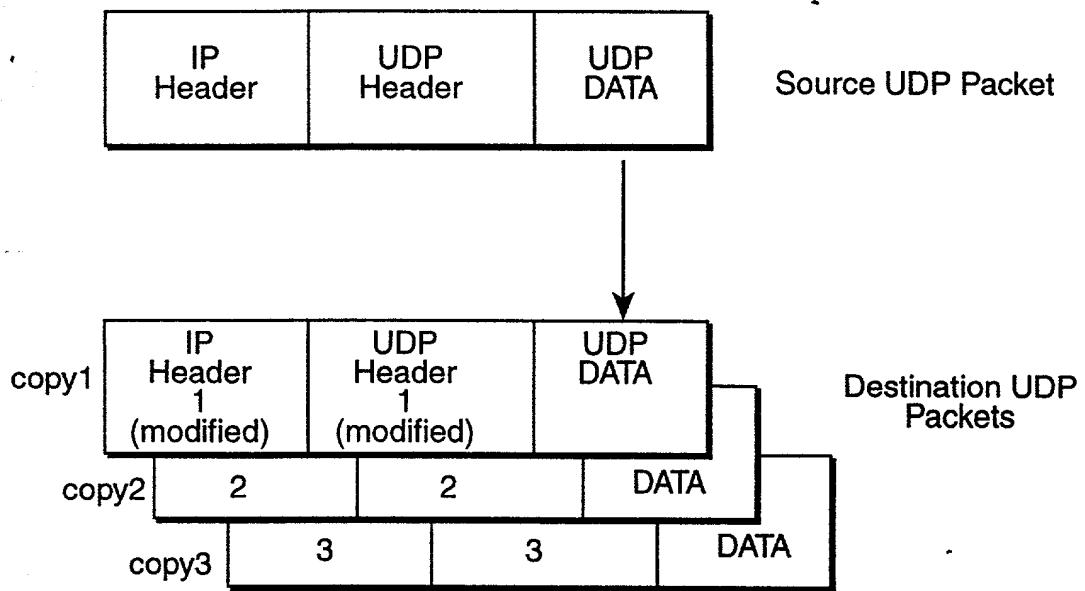
Fig. 7

Packet Replication Example with
Group Address (Destination) Change

Stream 1			

IP Group Address 239.241.3.4 Port 32000

Sex	Age Group	Port	Demographic Offset
M	0..18	32001	1
M	18..34	32002	2
M	34..	32003	3
F	0..18	32004	4
F	18..34	32005	5
F	34..	32006	6

Stream 2			

IP Group Address 239.241.3.4 Port 32007

Sex	Age Group	Port	Demographic Offset
M	0..18	32008	1
M	18..34	32009	2
M	34..	32010	3
F	0..18	32011	4
F	18..34	32012	5
F	34..	32013	6

⋮

Fig. 8

Example Demographic Address Mapping